

# **WEST WIND LABORATORY**

**INCORPORATED**

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## CHAPTER 1 INTRODUCTION

Described in this report are the facilities used, procedures used, and the results from wind tunnel tests for the Third Carquinez Straits Bridge between Crockett and Vallejo, California, at the north end of the San Francisco Bay. Wind tunnel tests were performed by the West Wind Laboratory, Inc. The results from the tests were used by Drs. Robert H. Scanlan and Nicholas P. Jones to evaluate the performance of the proposed bridge in extreme winds.

The following aerodynamic data were required by Drs. Scanlan and Jones to perform their evaluation of the performance of the bridge in winds:

- 1) Static aerodynamic lift, drag, and moment coefficients for the bridge deck section;
- 2) Aeroelastic flutter coefficients for the bridge deck section;
- 3) Response of the bridge deck section model to vortex induced loads;
- 4) Turbulence characteristics of winds downstream from the existing bridges (1927 and 1958);
- 5) Response of the full bridge in turbulent winds, with and without the existing bridges.

These data were required for the proposed bridge design.

In order to obtain the data required, tests were performed using two distinct types of models in the wind tunnel. Static aerodynamic coefficients, aeroelastic flutter coefficients, and vortex induced aerodynamic motions were obtained from wind tunnel tests using a detailed, 1:50 scale model of a section of the bridge deck. These tests were performed in smooth winds. The motions of the bridge deck and towers, in the final configuration, were obtained from wind tunnel tests using a 1:250 scale model in a 1:250 scaled atmospheric boundary layer, and in smooth flow. Aeroelastic flutter instabilities, and vortex induced motions are most likely to occur in smooth flow. Buffeting is expected to be extreme in a turbulent boundary layer. Results from tests in smooth flow and in a turbulent atmospheric boundary layer were expected to bracket the actual wind induced motions.

The bridge design studied in these tests, and modeled, is that which is shown in Figures 1.1 through 1.7. These drawings were provided to the West Wind Laboratory, Inc. by DE LEUW • OPAC • STEINMAN, A Joint Venture/Association. The data on these figures provided the basis for the section, full-bridge, and free-standing tower models.

Included in this part of the study are an introduction, a description of the facilities used for the tests, a description of the section model test procedures and results, a description of the full-bridge model test procedures and results, a description of the freestanding tower model procedures and results, and a description of miscellaneous component studies.